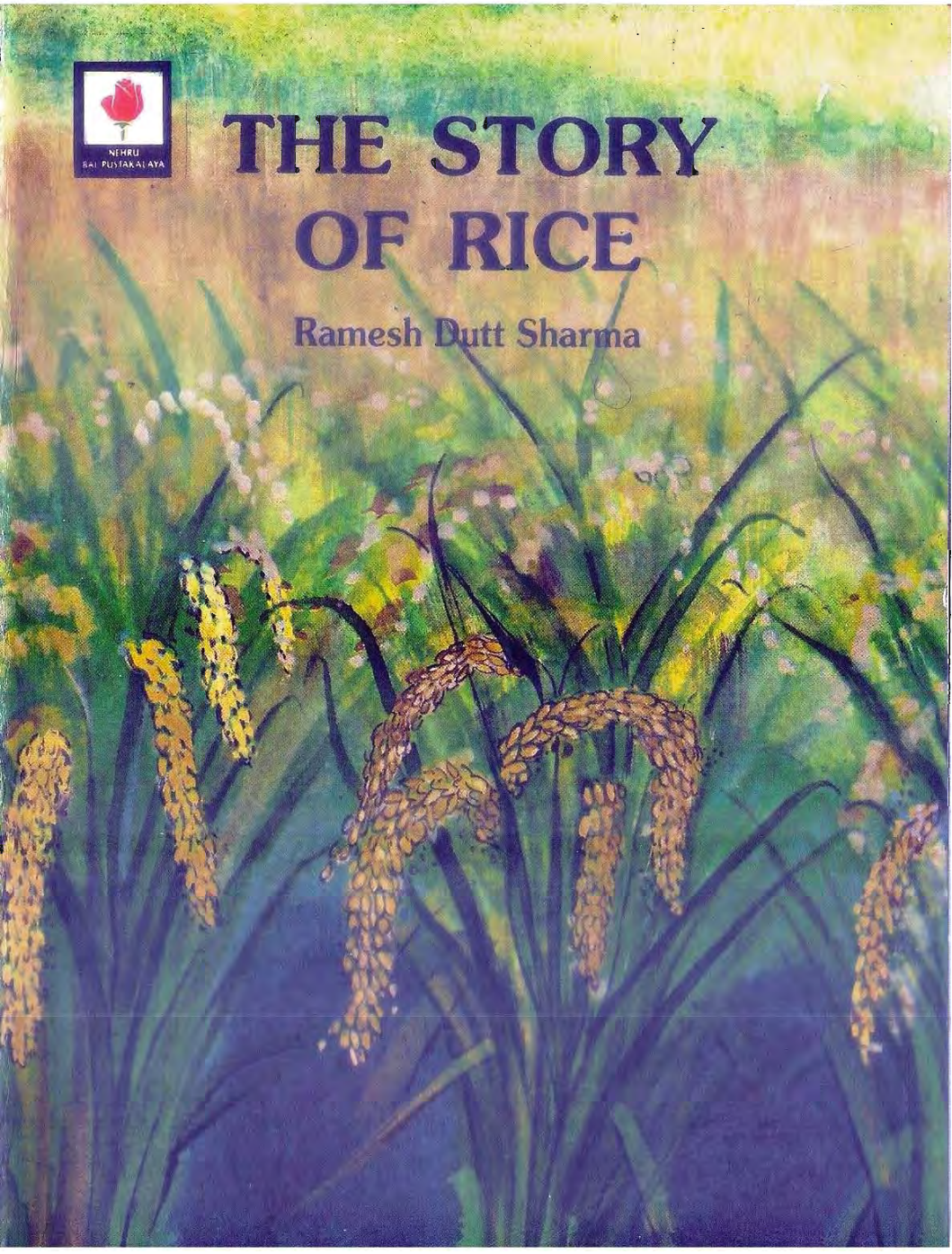
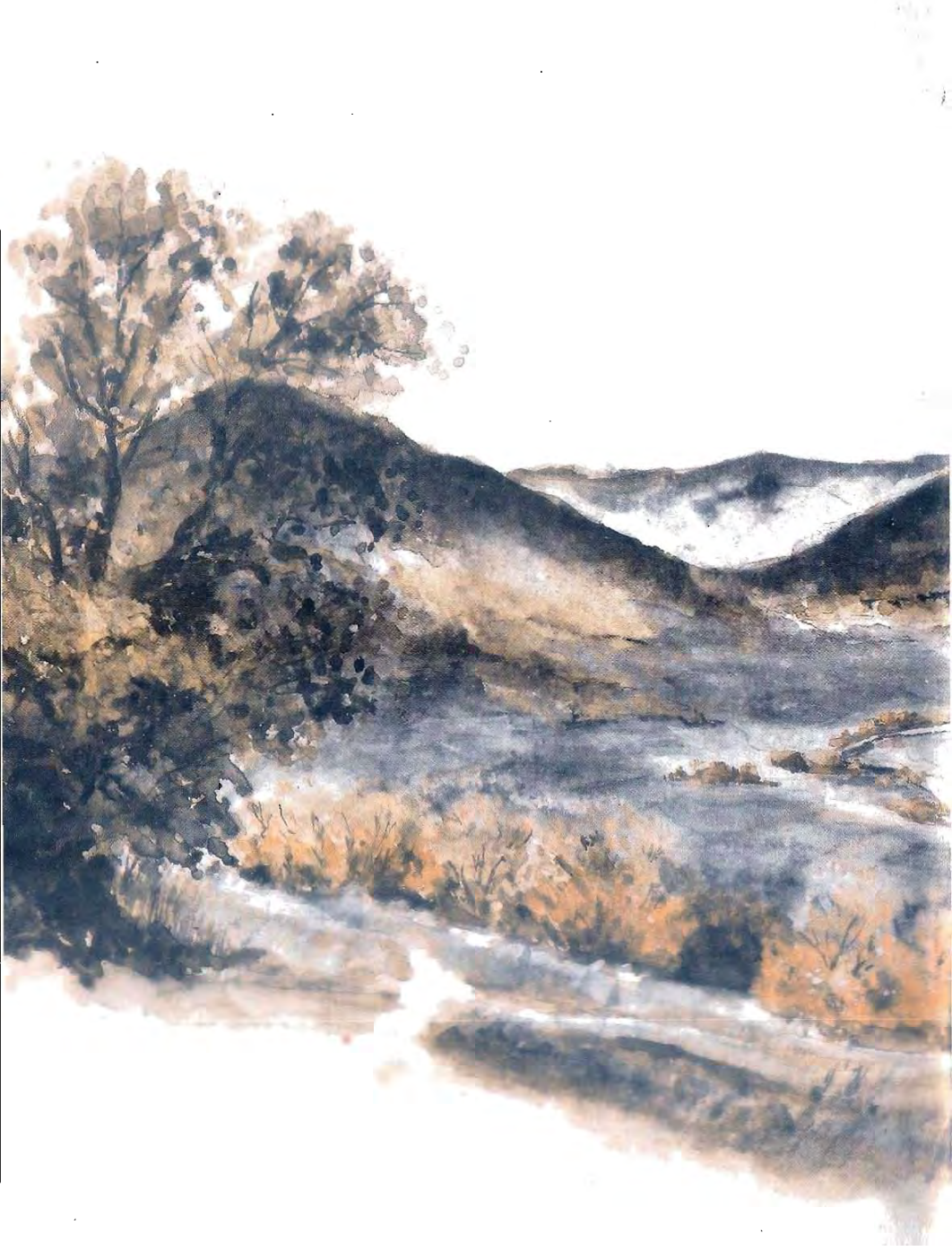




# THE STORY OF RICE

Ramesh Dutt Sharma







Nehru Bal Pustakalaya

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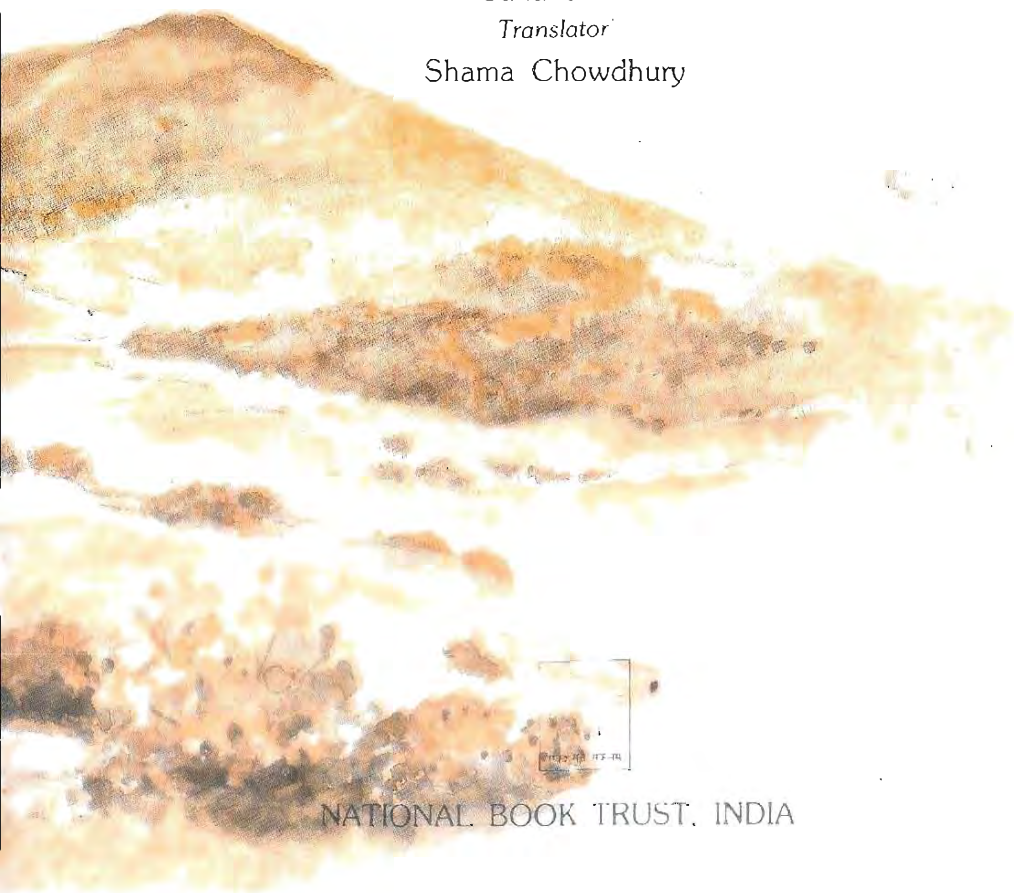
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## THE IMPORTANCE OF RICE

If you enjoy doing riddles, try this one:

What is cooked in earth that's nice  
Cooked in wood will fetch good price  
Turns into sweetmeats if cooked thrice?

The answer is rice. Rice can be cooked in earthenware pots, in bamboo tubes, and can be made into sweetmeats in special preparations cooked up to three times.

Rice is cooked all over the world, in small huts as well as in luxury hotels. Rice is the staple diet of more than two billion people in Asia and many millions more in Africa and Latin America. Every third person on earth eats rice every day in one form or another. More than one billion farmers make their living from rice and though there are over a hundred countries where

rice is grown, more than 90 per cent of the world's rice is grown and consumed in Asia alone.

Rice is the world's most versatile crop. In Nepal and Bhutan it grows as high as 2,750 metres above sea-level; in Kerala it grows as low as 3 metres below sea-level.

There are numerous stories about the origins of rice. In Japan it is believed that the Sun-Goddess Amatereshu-Omi-Kami was given grains of rice by a swan flying in heaven. (You see, even in heaven they couldn't live without agriculture.) The Sun-Goddess sowed the grain, which sprouted, blossomed and bore grain. Presenting the first fruits of this heavenly harvest to Prince Ninigi, the Goddess ordered, "Take this grain to the Land of Eight Great Islands." She meant Japan.

The most heart-warming story comes from the Philippines. One day, a young girl Agmay was sitting dangling her feet in a mountain spring, looking very sad. Her family were bonded slaves of a cruel master who made them work like animals. Her mother was dead. How long would her father be able to bear this misery? Tears welled in her eyes. Just then she saw a golden sheaf flowing down the stream. She picked it up and saw that it was laden with golden grain. She buried the grain in the mud near the stream. The grain sprouted and grew; and when it ripened the ears bore similar golden grains. Agmay sowed these grains too. Her father helped her. After a few years of planting and harvesting there was enough grain to fill their hut. Agmay's father was able to pay all his debts and became a free man.

In Along village in Arunachal Pradesh a tribal woman is credited with being the first rice farmer. Her figure is painted in a temple there.

However, according to a Thai legend, Lord Vishnu asked the





Rain-God Indra to teach rice farming to the people.

Like other plants, rice originally grew wild. Its history goes back 130 million years, when the seven continents were joined together. Gradually the continents started drifting apart. Except in ice-covered polar regions, rice has been growing everywhere.

The rice which is grown today is descended from a variety found in the northern Himalaya. From here it spread to the rest of India and throughout the world, barring Africa.

Rice has been found in archaeological sites in India, China, Japan, Korea, Thailand and several other countries. In India archaeologists have found charred grains of rice in more than thirty-seven sites. Apart from Mohenjodaro (now in Pakistan), in Lothal and Rangpur in Gujarat too, rice dating back to 2,000 BC has been found. Excavations in Uttar Pradesh, Bihar, Madhya Pradesh and Bengal reveal the importance of rice in Indian culture.

The species of rice grown in India is known as *Oryza indica*.

The word for a particular plant in different languages also gives us clues as to where it has travelled. The Latin word for rice, *oryza*, and the English "rice" are both derived from the Tamil word *arisi*. Arab traders took *arisi* with them and called it *al-ruz* or *arruz* in Arabic. This became *arroz* in Spanish and *oriza* in Greek. In Italian it is called *riso*, in French *riz*, in German *reis*.

In Sanskrit, paddy is called *urihi*. This became *vari* in Telugu. In Madagascar, on the east coast of Africa, rice is also called *vary* or *vare*. In Farsi, the language of Iran, the word *brinj* is derived from *urihi*.

Kautilya's Sanskrit treatise the *Arthashastra* refers to a rice variety *shashtik*, which took sixty days to ripen. This same rice is now called "saathie". A story illustrates its importance.



Gautam Buddha had a disciple Nagarjuna who was a good chemist. One day he heard of a certain sage who applied a special paste to the soles of his feet and vanished into thin air. Nagarjuna became his student and tried to find out the ingredients which went into this paste. One day he prepared his own paste and



rubbed it on his feet. He too vanished. . . . but a few moments later fell flat on the ground. He again applied the paste. Again he vanished and again fell flat. Seeing him bruised and bloody, his guru questioned him. Nagarjuna confessed making the paste in secret and begged forgiveness. His guru smelt the paste and said, "Son, you forgot only one ingredient—the saathee rice paste."

Rice has also played an important part in Buddhist culture. Gautam Buddha's father's name was Shudhodana, which means Pure Rice. It is said that after his long meditation under a banyan tree, the Buddha attained enlightenment after he had eaten *kheer*, brought by a forest-dweller Sujata. Hand in hand with the spread of Buddhism to India's neighbours—Burma, Indonesia, Thailand, China, Japan and Korea—went rice culture. Thus rice was a gift of India.

Hindu mythology has it that Lord Krishna was so pleased with his childhood friend Sudama's gift of two handfuls of roasted rice that in return he gave him the Earth and the Heavens. If his queen, Rukmini, had not stopped him, he would have given Sudama the Cosmos as well.

## RICE TRAVELS AROUND THE WORLD

The tradition of encouraging farming dates back to ancient times in China. To the south of Beijing, China's capital, is the Temple of Heaven. For centuries an Agricultural Festival was held here, which the Emperor attended dressed in yellow like a farmer. In the sacred field next to the temple, to the accompaniment of music, the Emperor would take the plough, and make three furrows.

About 2,500 BC, a Chinese Emperor, Shun Nung, is said to have taught the people the art of cultivating five cereals, rice being one of them.

In ancient days, there were no roads connecting countries yet rice seeds and the techniques of rice-farming spread far and wide. They were carried by seafaring traders, warriors and travellers. People who had never set eyes on rice before, exchanged it for gold and silver.



About 15,000 to 16,000 years ago, wild rice grew on the northern and southern slopes of the Himalaya. This variety of rice, known as indica, could withstand variations in temperature and even drought. It spread to northern and eastern India, to northern



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Southeast Asia, and to southern China. Before entering Sri Lanka in 543 bc, indica rice's made their way to Malaya and from there to the Indonesian island of Java.

The Igorot tribals of the Philippines tell the story of an honest



and hard-working family who during a famine could find nothing to eat but a few strange white grains. God appeared and taking the grains put them in a pot of water on the fire. It boiled and filled the vessel with white grains. This was rice.

Rice was introduced to Japan about 3,000 years ago from eastern China and perhaps Korea. Very soon rice became an integral part of Japanese life. Japanese children are taught to revere rice as though it were an elder of the household: "He who wastes rice will either become blind, go to hell or be ground to powder!" Rope woven from rice straw has become the Japanese New Year symbol. On the first, fifteenth and twenty-eighth of the month, and on all festive occasions red rice, *jeki-han*, is cooked by boiling rice with red beans. This is also a Chinese custom.

### **The Rice Story Written on the Winds**

In Africa, a domestic strain developed from wild rice. Its cultivation began about 3,500 years ago. A few centuries before Christ, Asian rice reached Africa from Java with Javanese sailors sailing in outrigger canoes. Settling on the eastern shores of Africa in Madagascar they started growing rice. Later sailors from the eastern coast of south India also came here via Oman, using the same route as the seamen from Malaya, Sri Lanka, and Arab traders. In this way rice travelled along with the monsoon winds. It is rightly said that the arrival of Asian cereals in Africa was written by the winds.

Rice is not mentioned in the Bible, nor in the early records of Egypt. It was first cultivated in the Nile Valley around AD 639. When Alexander returned from India he brought rice with him. His teacher Aristotle was the first European scientist to mention rice, which he called *oryzon*.



Rice reached Europe through several routes. Between the first and eleventh centuries, Arab traders took rice from India to Iran and then Egypt. From here it reached Spain and Sicily. The Moors of Spain carried it to Portugal in the eighth century. Later it was introduced to Italy and from there reached Bulgaria, Yugoslavia and Romania in 1468.

Russia first encountered rice in the reign of Peter I who imported it from Iran in the early 1700's. Some rices also reached Russia from East Asia, and were grown in the coastal areas of the Caspian Sea.

America received its first rice around 1609. It was grown in Virginia. Then in 1685 a ship from Madagascar docked at Charleston in southern Carolina, for repairs. When leaving, the ship's captain left behind a bag of rice. Thus began the cultivation of rice in Carolina.

President Thomas Jefferson was so impressed with the rice grown in the valley of the Po river in Italy, that he smuggled a pocketful back to America. This was in 1784 when he was ambassador to the court of the French King Louis XIV.

In 1522, a shipful of wheat arrived in Mexico. Mixed with the wheat were grains of rice. Interestingly this became a boon for Mexico.

### **Rituals Connected with Rice**

In Crowley in Louisiana (California), an International Rice Festival Queen is selected every year. In Korea every family keeps one vessel filled with rice grains. This is considered sacred and is not touched. In India no ritual or function is complete without the use of *akshata*—grains of rice coloured with *roli* or *haldi*—specially the wedding ceremony. And when the marriage ceremony is

over, women shower rice on the departing couple, in silent blessing that like rice they stay together, united and unbroken, facing all calamities.

This custom borrowed from India is found all over the world, in all religions. Everywhere, new-weds are showered with rice in the hope that they flourish like this sturdy grain. Thus has rice become an inseparable part of life.



## INSIDE A RICE PLANT

Wouldn't it be fun if there were a magic potion which made you tiny in an instant, and then back to your normal size, whenever you wanted! Imagine you were so small that you could only be seen through a microscope and you entered a rice plant through one of the millions of minute holes on its leaf. It would feel like being in an air-pipe for the air pressure would suck you down.

In the rice plant air-pipes go from the leaf to the stem and roots. It is because of them that paddy roots can "breathe" even when submerged. This is why rice is the only cereal which can grow in deep water.

We slowly crept into the roots of a rice plant. On the root were tiny root-hair which drew water from the soil. Along with the soil-water several minerals were absorbed by the plant. This is how rice gets its nourishment and why a tonne of rice uses up twenty kilograms of nitrogen to grow.





A little bored of being in the root, we moved towards the pipe which carried the water from the root up the plant. This is called the xylem. From our microscopic size the xylem looked like masses of water pipes.

In biology you must have learnt how soil-water reaches the top of a plant. There are two pressures working at the same time: root pressure pushes it up and water transpiring or evaporating from the leaves also pulls it up. This is the way each pore of the plant gets watered—be it a rice seedling or a massive tree.

We then entered a plant which was swimming six metres deep in water. By “swimming” I do not mean that it was literally flapping its roots and leaves and moving from one place to another—as the level of the water rises, the stalk grows. In fact the shoot of a floating rice plant grows a centimetre every hour—twenty-four centimetres in a day.

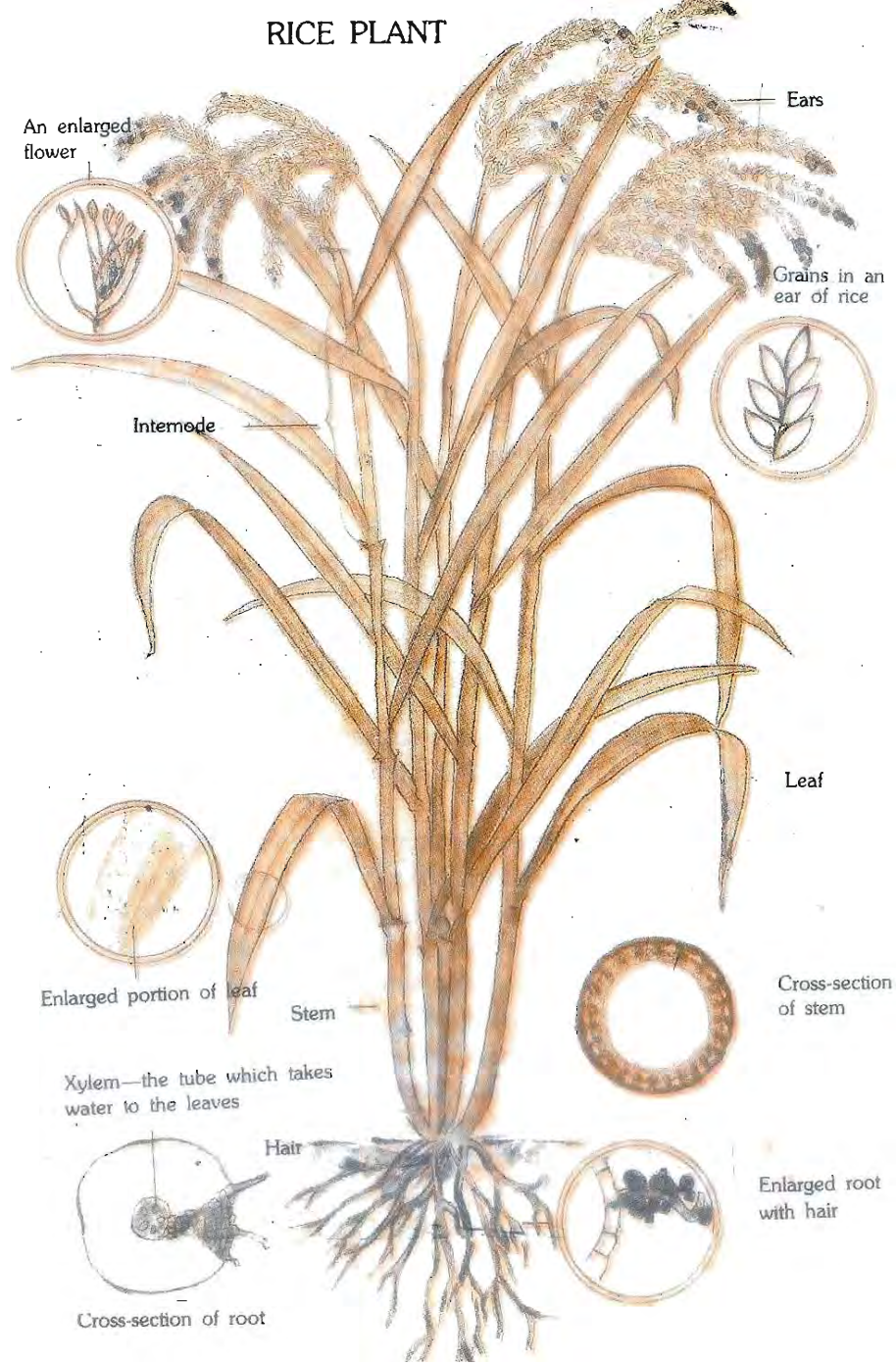
Even if the rest of the plant is submerged the top leaf, the flag leaf, keeps its head above water. Light and air pass through it into the entire plant.

Excess water activates chemicals which elongate the floating rice plant. The stem is jointed. The joints are called nodes. The part of the stem between two nodes is hollow. Because of the air in it, the rice plant keeps afloat. This part contains the chemicals which elongate the stem as the level of the water rises. These plants can live in five to six metres of water for up to a week.

There are usually four to fourteen stems called tillers with four to seven leaves on them. The head of rice bears the green ears which bend low with the weight of the ripe grain. An ear of rice grows twelve to forty-two centimetres long. It bears small flowers which become grain.

Now we are inside one of the small flowers, taking a walk

# RICE PLANT





around, to see how it is made. The flower opened this morning. The rice flower opens for barely two hours and immediately stamens begin to peep out.

Climbing the slender filament of a stamen to the top we come across two swollen bags—the pollen sacs—filled with pollen grain. And on looking inside, hidden in the middle, was the pistil.

You must know what takes place between the stamen and the pistil, for seeds to form. But let's remind ourselves. When the pollen sacs ripen, pollen from them falls on the frilly head of the pistil. It grows in the pistil, and gives the sperm which fuses with the egg inside to form the seed.

This process is known as fertilization. It takes five to six hours to complete fertilization in rice flowers. But it takes a long time for the seed to form and ripen—thirty days in hot and sixty-five days in cool climates. A ripe grain which is completely dry weighs twelve to forty-four milligrams.

Once Japanese scientists developed a rice variety in which each grain was the size of a peanut. But each plant produced only four grains! No farmer would want that!

There is a story about the colour of rice, too. It is said that the rice plant always existed but it bore no grain. Then along came Goddess Kuan Yin and sprinkled her own milk on the plant. The ears filled with white grain. Then the Goddess squeezed too hard and some drops of blood came out. That accounts for red rice.

Another story is popular in Bali, Indonesia. The God Bathara Ciwa gave a few grains of rice to a bird and told it to take the grain to the earth. The bird separated the ears of grain into their four colours, white, red, black and yellow, and flew off. On the way it felt hungry and ate up the yellow seed. It dropped the remaining grain in the fields. These became white, red and black rice.





## **A Gene Bank**

Next we thought of visiting the Gene Bank where thousands of varieties of rice from all over the world have been collected. This is a part of the famous IRRI or International Rice Research Institute in the Philippines.

We saw different varieties of rice seeds there. Thirty-five seeds of each variety were carefully kept in small brown packets with the name, number, country of origin and the date of collection typed on each packet. "The information about every variety is also fed into a computer," we were told by Dr Chang who was in charge of the Gene Bank.

He told us an amusing story about the difficulties of collecting the seeds of different rice varieties. "Once we were returning after collecting rice samples from a village perched on a hill in northeastern India. When we reached base camp, we were ravenous. We sat under a tree and fell upon our lunch-boxes. Suddenly a group of monkeys surrounded us. They took our lunch, of course, but we also had to surrender three bags of rare seeds! We climbed the hill again to collect the seeds!"



## GREEN FINGERS

Yes, it needs green fingers—wherever the tender rice shoots grow—be it in the icy cold, sweltering heat or in terraced fields carved from the mountains. These green fingers belong to the hard-working women whose gentle hands breathe life into the rice plant, from Africa to Vietnam. Whether it is sowing, planting, harvesting, pounding or cooking, the work connected with rice is mostly done by women. Their green fingers are busy everywhere, transplanting seedlings, delving deep into flooded lowlands taking care of floating rices or cutting the golden sheaves. Yet they smile and sing. The Filipinos have a song about this back-breaking work:

Planting rice is never fun;  
Bent from morn till the set of sun;  
Cannot stand and cannot sit;  
Cannot rest for a little bit.





## **The Eighth Wonder**

The most famous rice fields in the world are in Banaue in the northern province of Luzon in the Philippines. Here the mountains have been cut to make terraces for cultivation—terrace upon terrace soar to a height of 3,000 metres, covering an area of 23,000 square kilometres. Some terraces may date to 1,000 BC.

Ifugaos, the tribal people living in this region, recount a popular legend about the creation of the terraces. They say God appeared in a dream to a young man named Wigan and told him to marry a young girl called Bugan, and then go into the mountains. Wandering in the mountains of Banaue, Wigan and Bugan found two stalks with edible grains in a pond. They levelled the sides of the mountain to make flat fields to grow the grain. When the crop ripened, they sowed its grain in other fields. In this way the mountain was levelled and terraced fields flourished. These are known as the eighth wonder of the world. Water flows down from the mountains carrying rotting vegetation, manure and ashes, thus, irrigating and fertilizing the fields in a single operation.

## **Water-loving Plant**

From early times Asian farmers knew that rice was a water-loving plant. They showed great skill harnessing water for irrigation, digging lakes and wells, and making canals. At the site of Angkor in Kampuchea was found a canal running straight as an arrow for sixty kilometres.

More than eighty per cent of rice lands are rain fed and grow only one crop a year and if the rains fail, even that crop is gone.

In Japan, holy water from Buddhist temples is sent to drought-stricken villages and special prayers are recited. If the prayers are ineffective, the people even threaten the gods, hoping



to force rain from them. They bind the statue of Jizo with strong ropes and promise that if he brings rain, they will release him.

Scientists are now trying to develop strains which can withstand drought.

### **The Spirit of Rice and Mother Rice**

Rice is so much a part of the farmer's life that it has been given human or super-human qualities. In neighbouring Burma, where 4,600,000 hectares are under rice cultivation, the Karen tribals believe that there is a rice spirit, and they call it Kelah. The farmers of Sumatra and Bali in Indonesia attach great importance to the rice mother. Before sowing begins, the finest ears of grain are picked out and called Dewi Sri. Carrying these on their heads, singing and dancing, the farmers go to the fields.

In Bali many farmers still grow the old "Padi Bali" rice variety whose plants are more than the height of a man. At harvest time, the rice is cut, stalk by stalk, by hiding a small knife (ani-ani) in the palm of the right hand so that the rice will not be frightened.

In Vietnam, villagers believe that the rice spirit resides in the oldest mother in the household. According to a legend popular in the plains, at one time rice grains were as big and round as coconuts. After ripening they rolled by themselves, like footballs, from the fields to the huts. To welcome them, every hut was decorated. Once a lazy Vietnamese farmer forgot to decorate his hut and, closing the door, went off to sleep. The rice grains were so offended that from that day they shrank to their present size and stopped appearing at the door on their own. And now we have to plough a field, sow it, weed it, water it, kill the insects, harvest and thresh it, only then can we obtain the grains.

## **Respected Rice**

Rice is revered in Japan and is always referred to with the greatest respect. Several well-known Japanese names are related to rice. A former Prime Minister of Japan Mr Nakasone's name means "Mr Middle Root". His predecessor Mr Fukuda's name means "Rich Field" and Mr Tanaka "Middle Field". Here field refers to rice field. The word Honda means "main rice field" and Toyota means "bountiful rice fields". The airport at which you land on arrival in Japan is called Narita, which means "developing rice field".

Respect for rice is an age-old Japanese tradition. Every village has a shrine dedicated to Inari, the Rice God. The image of another God, Jizo, always has muddy feet. It is said that once a devotee of Jizo fell ill. So, Jizo worked all night in his field. That is why his feet are muddy. After the sowing, villagers in some localities maintain the custom of throwing handfuls of mud at each other and on the image of Jizo (rather like Holi revellers in north India) so that he will protect their rice fields.

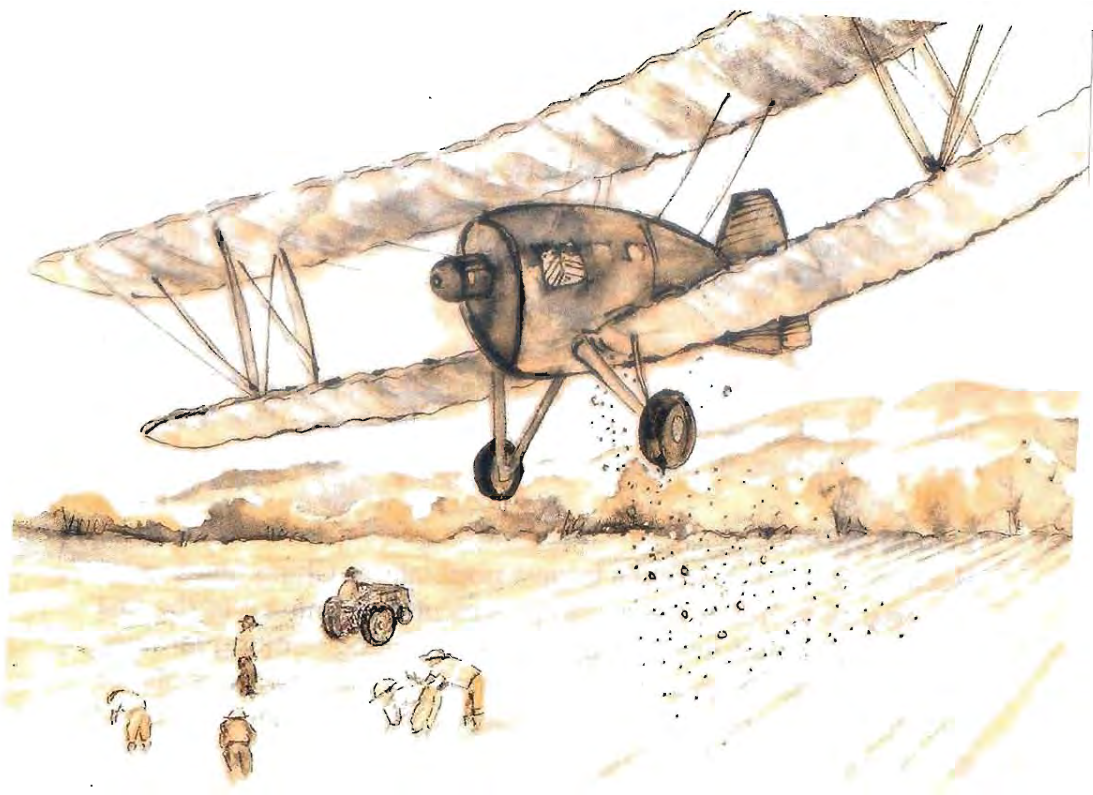
## **The Toil and Pain of Farmers**

Toil and pain is the lot of the rice farmer whether in Japan or India—though in varying degrees. From snow-laden Kashmir in the north to Kanyakumari in the south, millions of Indian farmers labour at cultivating rice.

The moist, warm coastal climate can produce three rice crops a year. Kuttanad is the rice-bowl of Kerala and the only place in the world where rice grows below sea-level.

## **Aerial Sowing**

A mechanical revolution began in the 1920's, in California when farmers began seeding their large rice fields from airplanes. Seeds



are soaked for twenty-four to forty-eight hours, ploughed fields are flooded with water, and then the seeds are dropped by airplanes from an altitude of about six metres. In a day an airplane can sow 160 to 200 hectares.

In Australia too, rice-growing is mechanized. Airplanes seed and combines harvest rice. America and Australia largely export their rice. In these technology-oriented nations, it takes one day in man-hours to grow a tonne of paddy, ten to twenty days in Brazil, twenty-five days in Japan, and 100 days in the rest of Asia.

### **Hybrid Rice**

Because it has the world's largest population, China gives great importance to human labour in its agriculture. China was the first to develop hybrid rice and spread its technology among farmers. Hybrid rice yields up to seven tonnes per hectare, which is one or two tonnes more than other varieties. In China the work of producing the seeds for hybrid rice is done mainly by women.

### **A Changing Landscape**

Rice fields flooded with water look silvery, as though covered in moonlight. After planting, the fields become a sea of green. When the plants grow taller, the gentle rain bends the shoots, and the passing wind makes ripples across the fields. Mature fields appear bathed in gold, and the subtle fragrance of ripening rice hovers in the air.

Every step in the growing of rice is marked by a ceremony. Indian poets have compared the joy of watching the half-bent young sheaves of the rice plant, filling with grain, to a grubby, crawling infant.

In Bali farmers refer to the plant as *beling* or pregnant, and



accordingly lavish care on it—protecting it from the Evil Eye, and frightening away birds, rats and insects. The gruelling schedule needed to grow rice has, however caused some cultures to die out. About two hundred years ago, in America nearly 40,000 hectares of rice fields stretched from north Carolina to the Golden Isles of Georgia. Now none exist.

On the other hand, the hard-working Asian farmer has stuck to rice-farming despite its hazards. He is happy if he gets electricity or cheap diesel in time to use his pump and irrigate his fields. Then he only needs manure, seed and a loan—for the rest he depends on his own labour.



## THE WORLD OF RICE RESEARCH

The first rice research institute was in Japan, where a cereal crop experiment station was set up in suburban Tokyo in 1886. In India rice research institutes were established in the 1900's. In 1946, the Central Rice Research Institute was set up in Cuttack in Orissa. Many new strains were developed here which ripen quickly and have a greater resistance to disease and insect pests. Scientists from eight Asian countries also participated in an ambitious hybridization programme in 1952 using japonica and indica rice varieties.

One of the participants in this programme was a thin, good-looking young man. He would go to the rice-fields in the early morning, collect pollen from selected plants and sprinkle it on rice-flowers in the laboratory, whose pollen had been artificially removed. Then he would cover the plants with an oil-cloth or paper bag and note the date and number on it. He was



so absorbed in his work that he often forgot mealtimes.

This young man was none other than Dr Swaminathan, whose full name is Dr Monkumbu Sambshivan Swaminathan. Dr Swaminathan who later not only became famous in India but throughout the world as an agricultural scientist. He was the first Asian Director-General of the International Rice Research Institute.

### **The Birth of IRRI**

The International Rice Research Institute, IRRI, was founded in 1960 in Los Banos about sixty kilometres from the Philippine capital Manila. The 1R 8 rice variety developed here has increased world rice production manifold. This variety was the result of a cross between an Indonesian variety Peta, and Dee-geo-woo-gen, a dwarf Taiwanese variety. 1R 8 was selected from 10,000 rice plants. Its strong stalk did not fall over in the wind and it efficiently converted soil nutrients into more grain and grew rapidly with the addition of chemical fertilisers.

Ganesan, a farmer from Kalambur village in Arcot district of Tamil Nadu sowed 1R 8 in his fields when it became available in 1967. This new variety produced such a plentiful crop that, when he had a son in July 1968, he named him 1R 8! Mr 1R 8 is now twenty-three years old (1991) and he combines his studies with helping in the fields.

If a new strain of rice is discovered anywhere in the world, it is sent to IRRI for examination. Every year about 3,000 varieties arrive, which are sent to 600 centres in about eighty-five countries.

### **Test-tube Rice and Hybrid Rice**

The Indian Agricultural Research Institute in New Delhi, better



known as the Pusa Institute, is the oldest agricultural institute in the country. Here, Basmati-type rice plants have been grown in test-tubes to increase the yield.

India was the first country to grow a plant from pollen alone. Using the same technique about eighty new varieties of rice hybrids have been developed in China.

### **Neem the Doctor**

Using neem seeds as an insect repellent was another Indian discovery which is now used all over the world. The IRRI entomologist Dr Ramesh Chandra Saxena extracted the bitter compound from neem seeds and made it into fine granules called bitters. A solution made from a spoonful of bitters, sprayed over a hectare of rice crops, is enough to check insects like the brown planthopper.



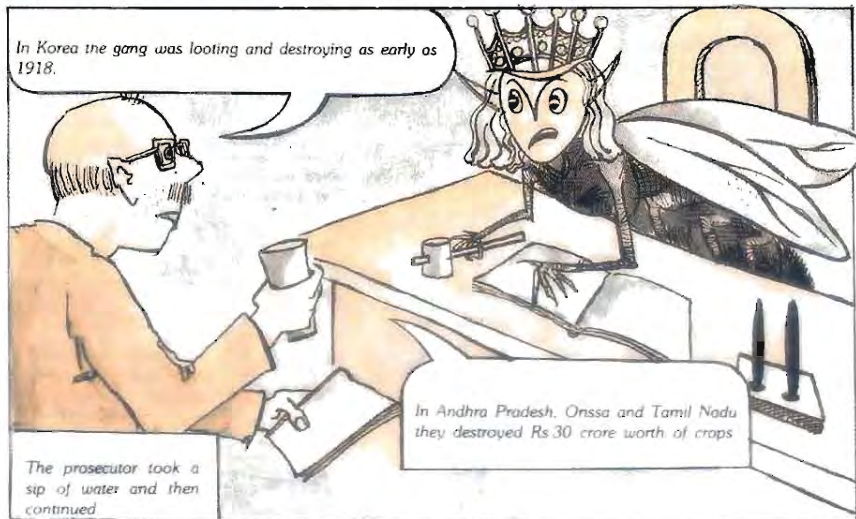
The Indian Directorate of Rice Research is located in Hyderabad. Here tests are conducted on how the different varieties of rice fare in the varying soils and climates of the country. Strains which prove hardy year after year, are selected and handed over to the National Seed Corporation for seeds to be prepared on a large scale.

Agricultural scientists are doing their best to see that rice becomes veritable “green gold” for the poor farmer.

Manual chores are slowly giving way to machines—saving labour and time. Sowing, harvesting and threshing machines are available to the farmer. A “drum seeder” has been developed which can sow eight to twelve rows at a time.

# ROBBERS OF THE GREEN GOLD

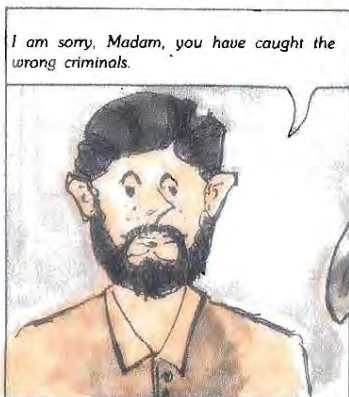
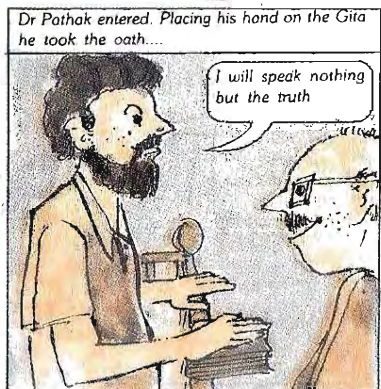
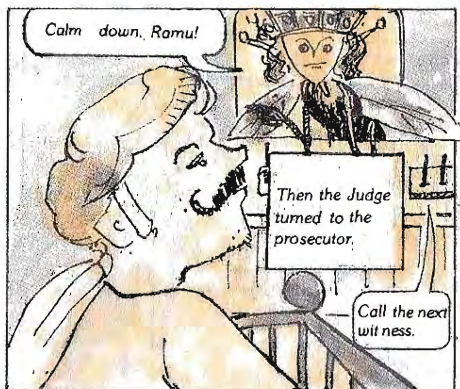
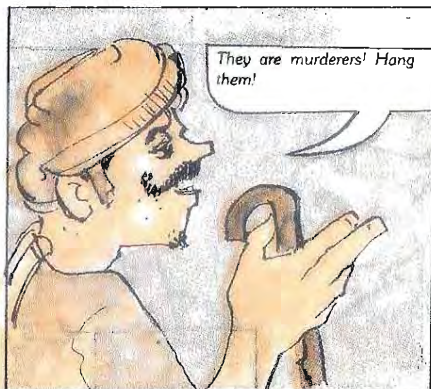
The government prosecutor in the state of Phylum Arthropoda was reading the charge. The Queen Bee was the Judge. The thieves who stole the green gold were under trial.

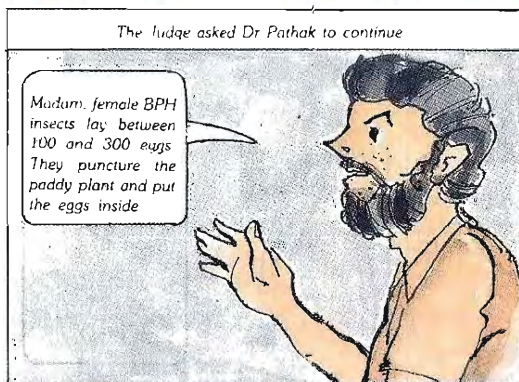
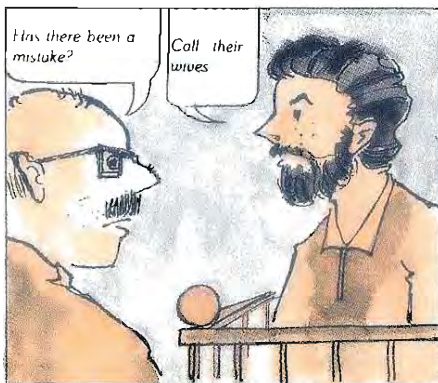




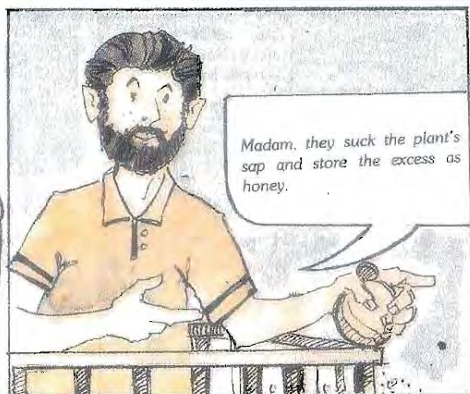


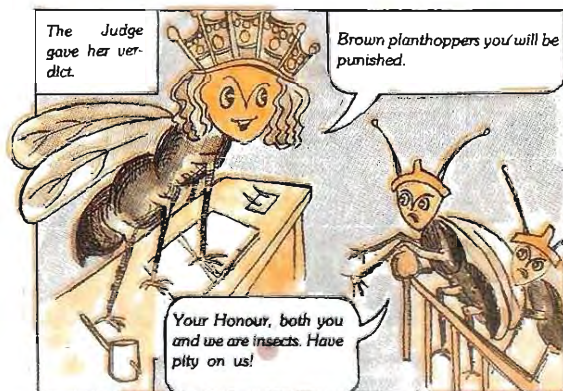
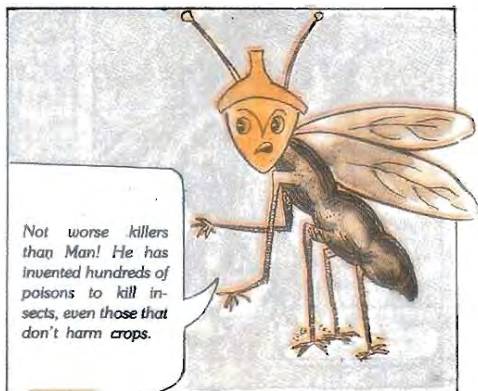
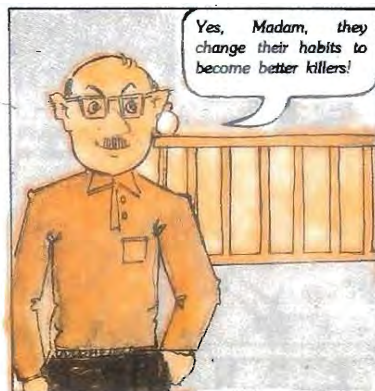














## AFTER THE HARVEST

The rice harvest is an occasion for a festival in all Asian countries. In Tamil Nadu Pongal is celebrated and in northern India Makar Sankranti. The latter marks the entry of the sun into the constellation of Capricorn and the time of year when the days begin to lengthen. This is also the time when rice and sugarcane are ready to harvest. On Pongal, each family boils rice in sugarcane juice or freshly made gur and places the delicacy on banana leaves to eat and offer to others.

After the harvest, rice has a bad time. It is beaten by sticks, dashed repeatedly against wooden planks or stones or crushed underfoot by people, tractors or animals. Even after this the grains cling to the stalk.

### **Threshing**

The process of separating the grains from the stalk is called



threshing. Once the entire village helped harvest the fields which ripened first and there were large communal threshing grounds in each village. Today even among four brothers there are four separate fields and threshing is done by individual families.

After the harvest, the sheaves of rice are spread out on the











cowdung-coated floor. A pillar is set up in the centre of the threshing area. Oxen or buffaloes are tied or rather yoked to a pole attached to the central pillar. The animals are driven round and round the pillar, treading on the sheaves. The grains fall off leaving the straw. Sometimes, animals are replaced by labourers. Women labourers thus “yoked” had bleeding feet from tramping the spiky stalks hour after hour.

Threshers have made the work easy. This machine has iron teeth which grind the sheaves, separating the grain from the stalk. Punjab alone has more than 250,000 threshers. A good thresher threshes 1,000 kg of grain an hour. In earlier times, the young boys and girls of the village gathered on moonlit nights in the threshing grounds and, frolicking and singing, threshed the grain. Their merry songs have been replaced by the whirring of threshers.

### **Winnowing and Drying**

In the play *Troilus and Cressida* Shakespeare says that merit and perseverance separate the strong from the weak, just as winnowing separates the heavy and light grains. In the threshing area, women stand on a stool, and filling a flat basket with the threshed grain, toss it against the wind. On airless days they create a breeze with a sari or sheet. Now, of course, electric fans are used. After winnowing, the grain is spread in the sun to dry.

### **Dehusking or Milling**

When new rice is pounded, a strange smell pervades the courtyard together with the tinkling of bangles as women move the pestle in the mortar. Rice can also be milled by a foot-operated hammer-mill called a *dheki*. Hand-pounded rice is

nutritious, because it retains the protein-rich bran layer. This is called brown rice.

### **Parboiled Rice**

The technique of making parboiled rice spread from India to the rest of the world. First the rice is soaked in water and excess water drained off. Then the grain is steamed or heated and dried. After this, it is pounded to remove the husk. In this way the outer layer of the grain turns hard and does not break during milling. It becomes yellowish and has a glossy appearance. It not only retains a better shape but is also more nutritious than other rice. Now a fifth of the world's rice is parboiled.

The world understood the importance of the Indian art of making parboiled rice only after paying a heavy price. In 1882 when a Japanese ship returned after a nine-month voyage twenty-five of its 276 crew were dead, and the rest were listless. It was discovered that they had eaten boiled rice three times a day but this was polished rice from a mill and had had its nutritive outer layer removed. The same disease was noticed in Malaysian and Javanese sailors, and it was called "beri-beri" which means "extreme weakness" in Sinhalese. In beri-beri the arm and leg muscles become so weak that it is difficult even to move about. On being fed mill rice even hens fell ill, but recovered when given parboiled rice. In polishing and making rice glossy, vitamins were lost. These vitamins were given the name "Vitamin B". Before this discovery nobody knew about vitamins. The Dutch scientist Dr Eijkman was the first to do research on this, and was awarded the Nobel Prize in 1929, a year before his death.

An Indian institute once tried to improve on the traditional method of making parboiled rice but the rice became so hard that









it was called "iron rice!" Parboiled rice is also suitable for making flaked and puffed rice.

## Old Rice

According to the Chinese philosopher Confucius, "If you have old rice to eat, water to drink and a pillow to rest your arm, all is joy." Old rice contains certain chemicals which, when cooked, emit a delicate fragrance. This is popular only in Asian countries.

Rice which is stored at home has to be protected from mould and insects. In 1960-61 in England some 100,000 turkeys suddenly died. It was discovered that there was mould in their feed.

Mould develops if the grain moisture content is higher than twenty-two per cent. Fifty to sixty species of insects attack rice during storage. To deal with this problem in developed countries like America, oxygen is sucked out of the godowns, thus killing the insects by suffocation. Flying insects are destroyed by insecticides in the form of mists, smokes, vapours or fogs. Rice stored in steel silos is well protected.

In the *Puranas* it is said that during the Great Flood all animals and plants were drowned. Manu alone survived. The storing characteristics of rice helped him keep alive for he kept two cereals, unhusked rice and barley, in his boat. Both cereals have a hard husk and this protected them from spoilage on the long journey.

## DELICIOUS RICE

"We don't eat worms," the hunters said grimacing, and pushed away the rice which had been served to them on banana leaves. After many days spent wandering in the jungle, the hunters had arrived at a little hut, tired and hungry. After they had had a wash, rice was served. On the insistence of their host they tasted the grains. They were so delicious that the hunters took another helping and then another. And, when they were leaving, the hunters asked for a few grains to take with them. The Cordillera tribals of the Philippines say that the host who introduced rice to the hunters was a god.

### **Nutritious Rice**

In 1947, there were 24,000 deaths from beri-beri in the Philippines. The nutritional quality of the rice was improved with vitamins and then supplied to the people. Within twenty-one







months of introducing enriched rice beri-beri disappeared.

A mixture of rice, lentil and sesame was given in quantities of twenty to forty grams to four-to six-month old infants. Within eight months they had rosy cheeks.

In south India, rice water is usually not thrown away. It is very nutritious. After the evening meal, farmers soak left-over rice in clay pots and the next morning eat this before setting off for their rice fields and the day's hard work. This rice gruel is not only popular in south India but also in Bengal and Orissa.

To avoid loss of nutrients rice must be cooked in the amount of water that the rice can absorb. Rice expands so much that a cup of uncooked rice becomes three cups when cooked.

A protein-rich rice flour called CHP (chemically high protein) has also been developed. It is made by adding an enzyme which is good for the digestion. Interestingly this enzyme was obtained from an ordinary fungus which often appeared on rice.

In Japan a vitamin-enriched rice is marketed under the name "Poly-Rice" and "Shingen" which means "brown rice in the new age". It was found that this nutritious rice increased the red blood cells in the blood.

Rice is digested in just one hour while most cereals take two to four hours.

### **Basmati Rice**

The Basmati rice produced in India and Pakistan is very popular all over the world. Its aroma improves with age and it can be stored for two to five years. This is the most fragrant of rice varieties. The long, slender Basmati grains elongate to more than twice their normal size when cooked and are used specially in *pulaos* and *biryani*.

But the most expensive rice is wild rice or Indian rice. This is not really a rice. It grows in marshes and in the shallows of streams and ponds and was an important food of North American Indians.



It is considered a delicacy and because of its limited supply is a luxury food.

### **The Infinite Variety of Rice Preparations**

The south Indian *idli* and *dosa* appear to have conquered the world. To make them, parboiled rice and *urad dal* paste are mixed in a three to one ratio. The mixture is left to ferment overnight. That is why *idlis* are light and fluffy. At south Indian feasts there are dozens of rice preparations—plain rice, lemon rice, tamarind rice, curd rice, coconut rice, vegetable rice, sweet rice seasoned with *kewara* and dry fruit. Then there are a variety of *kheers*—the most popular is made by boiling rice in milk and adding a sprinkle of almonds and raisins. Rice cooked in sugarcane juice is a particular favourite of some people.

In Japan many delicacies made from rice are available in colourful shiny packets.

The Chinese noodle has truly wrapped itself around the world. Mark Pi, a Chinese Chef, holds the noodle-making record in his restaurant in Columbus, Ohio in the USA. On 12 February 1982, Pi made 2048 noodles in thirty-four and a half seconds. Each noodle was more than 1.7 metres in length, and the longest was 282 metres. Thirty kilograms of rice flour and thirty-six eggs were used in making this noodle.

Eating rice dishes, Chinese and Japanese style, with chopsticks is no easy matter. Japanese chopsticks are long and thin like pencils whereas Chinese chopsticks are half as long but somewhat thicker. Japanese rice is sticky so it is easy to pick it up with chopsticks. But the Chinese hybrid rice can only be persuaded onto your chopsticks if a sauce is spooned over it. Sometimes Chinese rice also has mushrooms. They are so slippery that they

tend to run away on the sight of the chopsticks.

The easiest and most preferred way of eating rice is with the fingers.





## PADDY FOR PROSPERITY

There are many uses to which the rice grain and plant have been put. Near the city of Tainan in Taiwan are the ruins of a 300-year old Dutch fort at Anping made from rice starch. Rice was boiled in huge vats with an equal quantity of raw sugar. Then powdered conch and oyster shells were added. The resulting mortar was used like cement, for, when dry, it is as hard as rock.

Since ancient times, the Chinese have made glue from rice flour because rice grains are ninety per cent starch. Break a rice grain and stain it with iodine. If it turns red or brown, the variety is waxy, glutinous or sticky. If it turns purplish-blue, the rice is non-waxy and non-glutinous.

Apart from the grain, other parts of the paddy plant also have innumerable uses. From rice you get straw and chaff.

## What Straw Can Do

After the grain has been removed what is left is known as rice straw. The length of rice straw varies from about a metre or two upto seven metres—the stalk of floating rice is really so long!

Rice straw and rice hulls are low in protein but after soaking in



water and being treated with lime, ammonia, urea, etc. can be used as feed for cows and buffaloes. Rice straw and hulls mixed into the soil increase the yield of the next crop.

Mushrooms grow well on rice straw. Rice straw is also used as litter in chicken coops and stables and afterwards can be used as cattle feed or manure.

### **Rice Houses**

Rice hulls mixed with soil can substitute for sand and be added to cement to make building-blocks. Large bricks can be made too, in which rice hull ash can replace fifty per cent of cement. To make bricks, one part of rice hull ash is mixed with ten parts of damp soil. These processes have been developed and taught by IRRI scientists.

### **Straw and the Computer**

Rice straw contains silica, from which silicon can be produced. Silicon is used to make chips and solar cells for computers and electronic machinery. It can also be used in the glass and enamel industries.

Ethanol or power alcohol can be produced by fermenting rice straw and hulls. This can be used instead of petrol in cars. Rice hull powder is being used to make fibreboard. Hardboard made of rice straw can replace wood chips.

Water can be purified using rice hulls. Stream or pond water is first filtered through coconut fibre, then through burnt rice hulls. Solid particles of mud, etc. are removed by the fibre; the microscopic bacteria are filtered out by the burnt rice hulls.

In spite of having so many varied uses, rice straw and hulls are largely used as fuel. In India thirty per cent of rice hulls are used in

hull fired boilers. Most farmers burn the hulls in their fields after the harvest and the straw in the threshing area after the threshing.

### **Earnings from Bran**

Straw is the outer covering on the grain. Inside this there is a brown layer which is known as the bran. Similarly, inside the grain is the germ. Both the bran and germ are rich in oil, protein and carbohydrates. They are also a rich source of vitamin B.

Rice bran contains fifteen to twenty per cent oil. The main producers of rice bran vegetable oil are India, China and Japan.

### **The Magic Formula Against Poverty and Hunger**

Ultimately, however, rice is grown for eating. Rice gives a higher production of food per hectare than almost any other crop.

The world produces some 400,000,000 tonnes of rice every year. If this were loaded onto a goods train, we would need a train long enough to go around the earth.

The Igorot tribals of the Philippines tell the story of how God took pity on the hardships of the fisherfolk and instructed them to find the island where mountains of gold were growing. They set sail and found an island where indeed there appeared to be mountains of gold. When they came closer, they saw that the gold was ripened rice which was gleaming in the sun.

The importance of rice can be gauged from a tribal story. A farmer who went to heaven saw the golden grains of rice. He wanted to grab a handful, but they were heavily guarded. Undaunted, he leapt over the wall. He fell down and injured himself but he did not give up. He made his wound deeper so that he could stuff it with more rice, and bandaged it. He came limping out of heaven, but nevertheless brought rice to the earth.



Farmers have been growing rice for 7,000 years. But, when you have your next plate of rice, remember how hard the farmer has had to work and the effort that has gone into bringing you your plateful.







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